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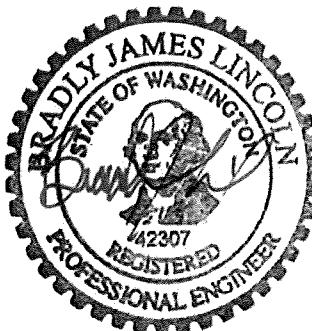


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Hagar Development Traffic Impact Analysis

Jurisdiction: City of Monroe

February 2015



GTC #14-211

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1. DEVELOPMENT IDENTIFICATION

Gibson Traffic Consultants, Inc. (GTC) has been retained to provide a traffic impact analysis for the proposed Hagar development to address the City of Monroe, Snohomish County and Washington State Department of Transportation (WSDOT) traffic impacts. Brad Lincoln, responsible for this report and traffic analysis, is a licensed professional engineer (Civil) in the State of Washington and member of the Washington State section of ITE.

The Hagar development is proposed to consist of a total of 34 single-family residential units. Existing land uses at the site have varied and the site is currently unoccupied. Credit for one single-family residential unit has been included in the analysis as a conservatively low estimate for previously mitigated trips. The analysis in this report has therefore been performed for 33 net new single-family residential units. The development site is located north of Currie Road and east of Fryelands Boulevard. Access to the development will be via Currie Road and a site vicinity map has been included in Figure 1.

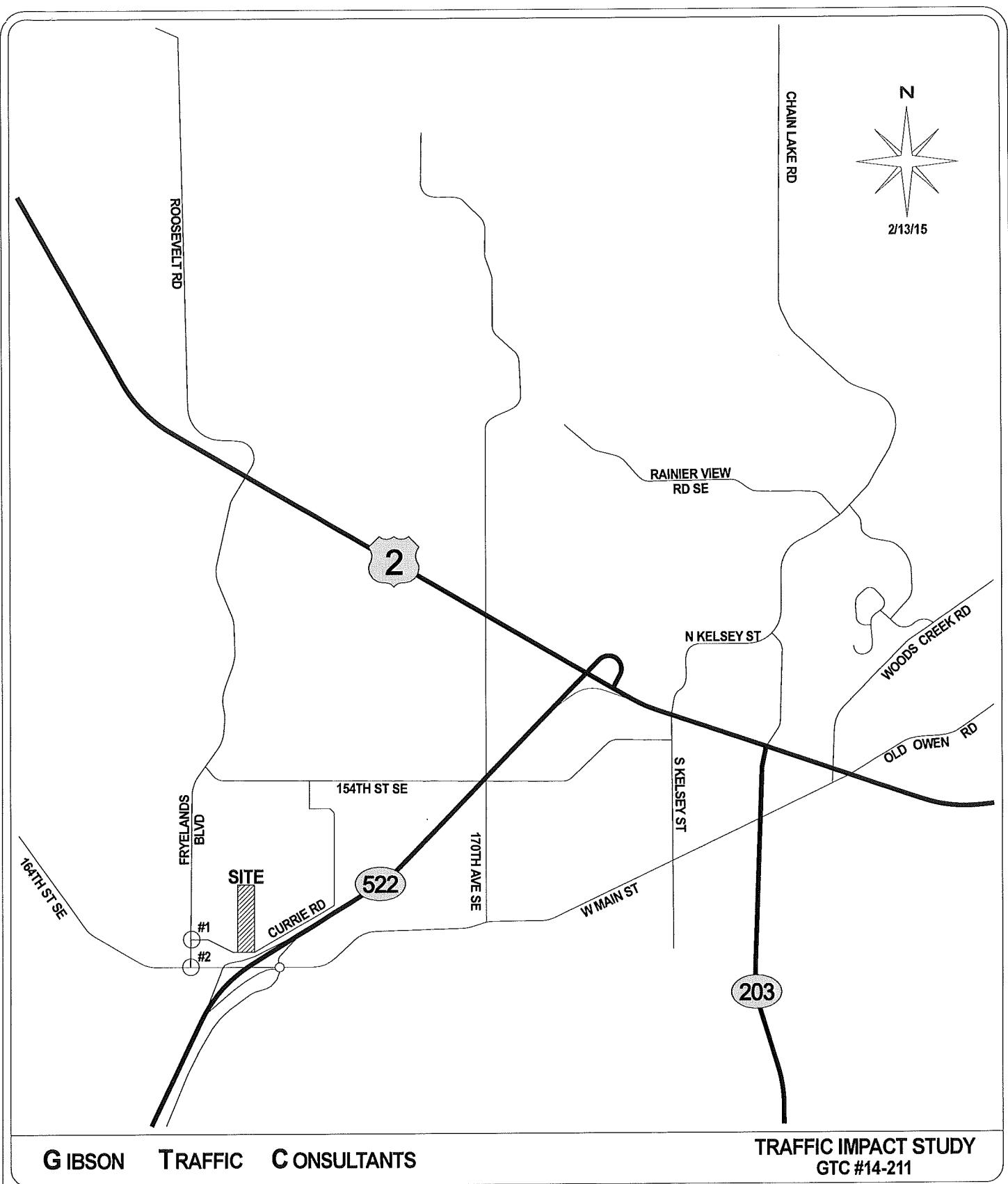
2. METHODOLOGY

Trip generation calculations for the Hagar development have been performed utilizing average trip generation data contained in the Institute of Transportation Engineers' (ITE) *Trip Generation, 9th Edition* (2012). The distribution of trips generated by the site is based on approved distributions for similar developments in the site vicinity.

Intersection level of service analysis has been performed based on scoping discussions with Brad Fieldberg, City of Monroe Public Works Director. Level of service analysis has been performed for the following intersections:

1. Fryelands Boulevard at Currie Road
2. Fryelands Boulevard at 164th Street SE

Congestion at intersections is generally measured in terms of level of service (LOS). In accordance with *Highway Capacity Manual: 2010 Edition (HCM)* by the Transportation Research Board, road facilities and intersections are rated between LOS A and LOS F, with LOS A being free flow and LOS F being forced flow or over-capacity conditions. The level of service at signalized, roundabout and all-way stop-controlled intersections is based on the average delay of all approaches. The level of service for two-way stop-controlled intersections is based on average delays for the stopped approach with the highest delay. Geometric characteristics and conflicting traffic movements are taken into consideration when determining level of service values. A summary of the intersection level of service criteria is included in Table 1.



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HAGAR DEVELOPMENT
33 NEW SINGLE-FAMILY UNITS

CITY OF MONROE

TRAFFIC IMPACT STUDY
GTC #14-211

LEGEND



DEVELOPMENT SITE

STUDY INTERSECTION

FIGURE 1
SITE VICINITY
MAP

Table 1: Level of Service Criteria for Intersections

Level of ¹ Service	Expected Delay	Intersection Control Delay (Seconds per Vehicle)	
		Unsignalized Intersections	Signalized Intersections
A	Little/No Delay	≤ 10	≤ 10
B	Short Delays	$>10 \text{ and } \leq 15$	$>10 \text{ and } \leq 20$
C	Average Delays	$>15 \text{ and } \leq 25$	$>20 \text{ and } \leq 35$
D	Long Delays	$>25 \text{ and } \leq 35$	$>35 \text{ and } \leq 55$
E	Very Long Delays	$>35 \text{ and } \leq 50$	$>55 \text{ and } \leq 80$
F	Extreme Delays ²	>50	>80

The City of Monroe has a level of service threshold of LOS C for collector road intersections and LOS D for arterial road intersections. The City of Monroe also has an interlocal agreement with WSDOT for intersections along US-2, SR-203 and SR-522. The interlocal agreement states that the level of service needs to remain at LOS D for intersections operating at LOS D before development and LOS E for intersections that operate at LOS E before developments. Intersections operating at LOS F before development will require mitigation. The level of service analysis has been performed utilizing the *Synchro 8.0* software and is reported based on the *Synchro 8.0* output.

The City of Monroe also has an interlocal agreement with Snohomish County to provide turning movements at Snohomish County key intersections impacted with 3 or more directional peak-hour trips on an approach or departure and for traffic mitigation fees.

¹ Source: *Highway Capacity Manual 2010*.

LOS A: Free-flow traffic conditions, with minimal delay to stopped vehicles (no vehicle is delayed longer than one cycle at signalized intersection).

LOS B: Generally stable traffic flow conditions.

LOS C: Occasional back-ups may develop, but delay to vehicles is short term and still tolerable.

LOS D: During short periods of the peak hour, delays to approaching vehicles may be substantial but are tolerable during times of less demand (i.e. vehicles delayed one cycle or less at signal).

LOS E: Intersections operate at or near capacity, with long queues developing on all approaches and long delays.

LOS F: Jammed conditions on all approaches with excessively long delays and vehicles unable to move at times.

² When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection.

3. TRIP GENERATION

The trip generation calculations for the Hagar development are based on the average trip generation rates for ITE Land Use Code 210, single-family detached housing. The development will have a total of 34 single-family units with a credit of 1 single-family unit for previous land uses. The trip generation of 33 net new units for the Hagar development is summarized in Table 2.

Table 2: Trip Generation Summary

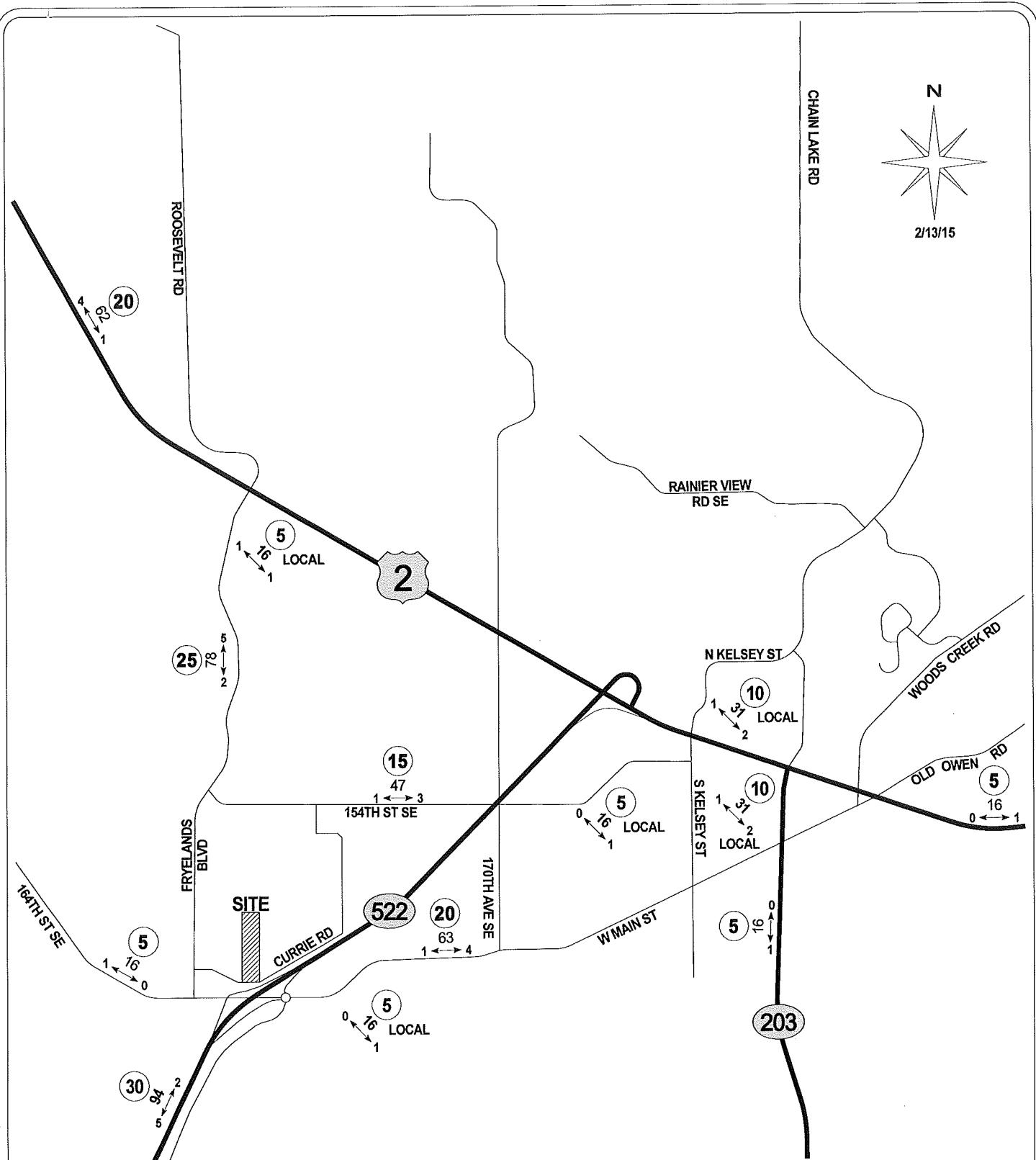
33 New Single-Family Residential Units	Average Daily Trips			AM Peak-Hour Trips			PM Peak-Hour Trips		
	Inbound	Outbound	Total	Inbound	Outbound	Total	Inbound	Outbound	Total
Generation Rate	9.52 trips per unit			0.75 trips per unit			1.00 trips per unit		
Splits	50%	50%	100%	25%	75%	100%	63%	37%	100%
Trips	157.08	157.08	314.16	6.19	18.56	24.75	20.79	12.21	33.00

The 33 new units are anticipated to generate 314 average daily trips with 25 AM peak-hour trips and 33 PM peak-hour trips. The trip generation calculations are included in the attachments.

4. TRIP DISTRIBUTION

The distribution of trips generated by the Hagar development is based on previously approved traffic studies conducted in the site vicinity for residential developments. It is anticipated that 25% of the development's trips will travel to and from the north along Fryelands Boulevard. Approximately 15% of the development's trips will travel to and from the east along Currie Road. It is estimated that 30% of the development's trips will travel along W. Main Street, twenty-five percent to and from the east and five percent to and from the west. The remaining 30% of the development's trips are anticipated to travel to and from the south along SR-522. Detailed distributions are included in Figure 2 for the AM peak-hour and Figure 3 for the PM peak-hour.

The interlocal agreement with Snohomish County requires key intersections impacted with 3 or more directional peak-hour trips on any approach or departure to be shown. The Hagar development will impact 2 different key intersections. The key intersection impacts are shown in detail in the attachments of this report. Snohomish County's trip distribution policies state that trips along US-2 do not need to be distributed west of 88th Street SE. Development trips on US-2 are expected to be through-trips at 88th Street SE. Development trips traveling to and from the south along SR-522 and SR-203 are anticipated to travel to and from King County.



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33 NEW SINGLE-FAMILY UNITS

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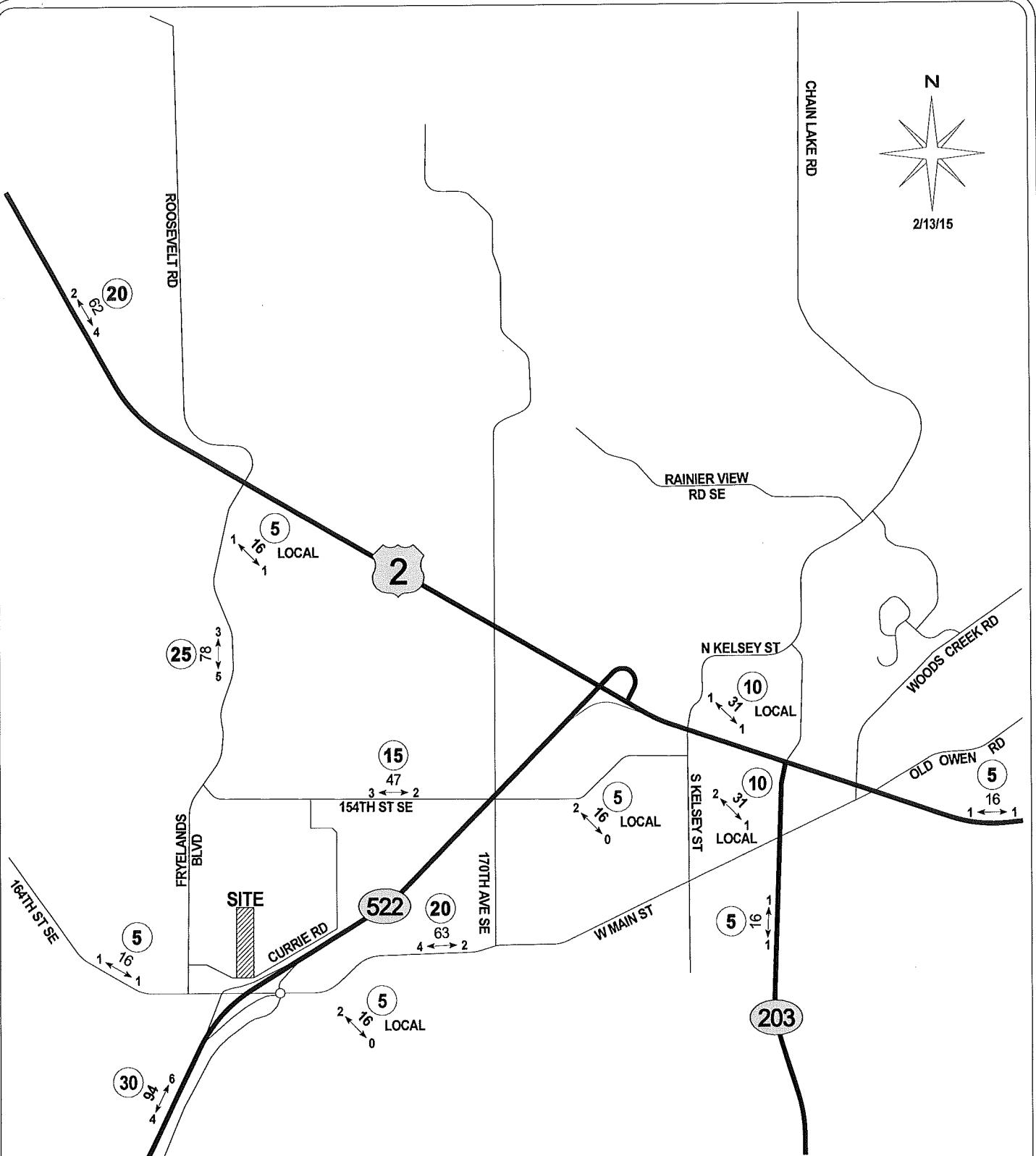
LEGEND

AWDT AM <--> PEAK

NEW SITE TRAFFIC (DAILY/PEAK-HOUR)

TRIP DISTRIBUTION % (indicated by a circled 'XX')

FIGURE 2
DEVELOPMENT
TRIP DISTRIBUTION
AM PEAK-HOUR



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HAGAR DEVELOPMENT
33 NEW SINGLE-FAMILY UNITS

CITY OF MONROE

LEGEND
AWDT
PM ← PEAK

NEW SITE TRAFFIC
(DAILY/PEAK-HOUR)



TRIP DISTRIBUTION %

TRAFFIC IMPACT STUDY
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FIGURE 3
DEVELOPMENT
TRIP DISTRIBUTION
PM PEAK-HOUR

5. INTERSECTION LEVEL OF SERVICE ANALYSIS

The intersections that have been analyzed as part of this report are based on scoping conversations with Brad Fielberg from the City of Monroe. Level of service analysis has been performed for the following intersections for the weekday PM peak-hour:

1. Fryelands Boulevard at Currie Road
2. Fryelands Boulevard at 164th Street SE

These are the only two major intersections impacted with 10 or more development PM peak-hour trips.

5.1 Turning Movement Volumes

The existing turning movements at the study intersections were counted by the independent count firm of Traffic Data Gathering (TDG). The counts were performed between 4:00 PM and 6:00 PM, the typical PM peak-period. The turning movement counts were collected in February of 2015. The existing turning movements at the study intersections are shown in Figure 4.

The future volumes have been calculated for the year 2025. The 2025 baseline turning movements have been calculated by applying a 2% annually compounding growth rate. The 2025 baseline turning movements at the study intersections are shown in Figure 5.

The 2025 future with development turning movements were calculated by adding the development's turning movements to the 2025 baseline turning movements. The 2025 future with development turning movements are shown in Figure 6.

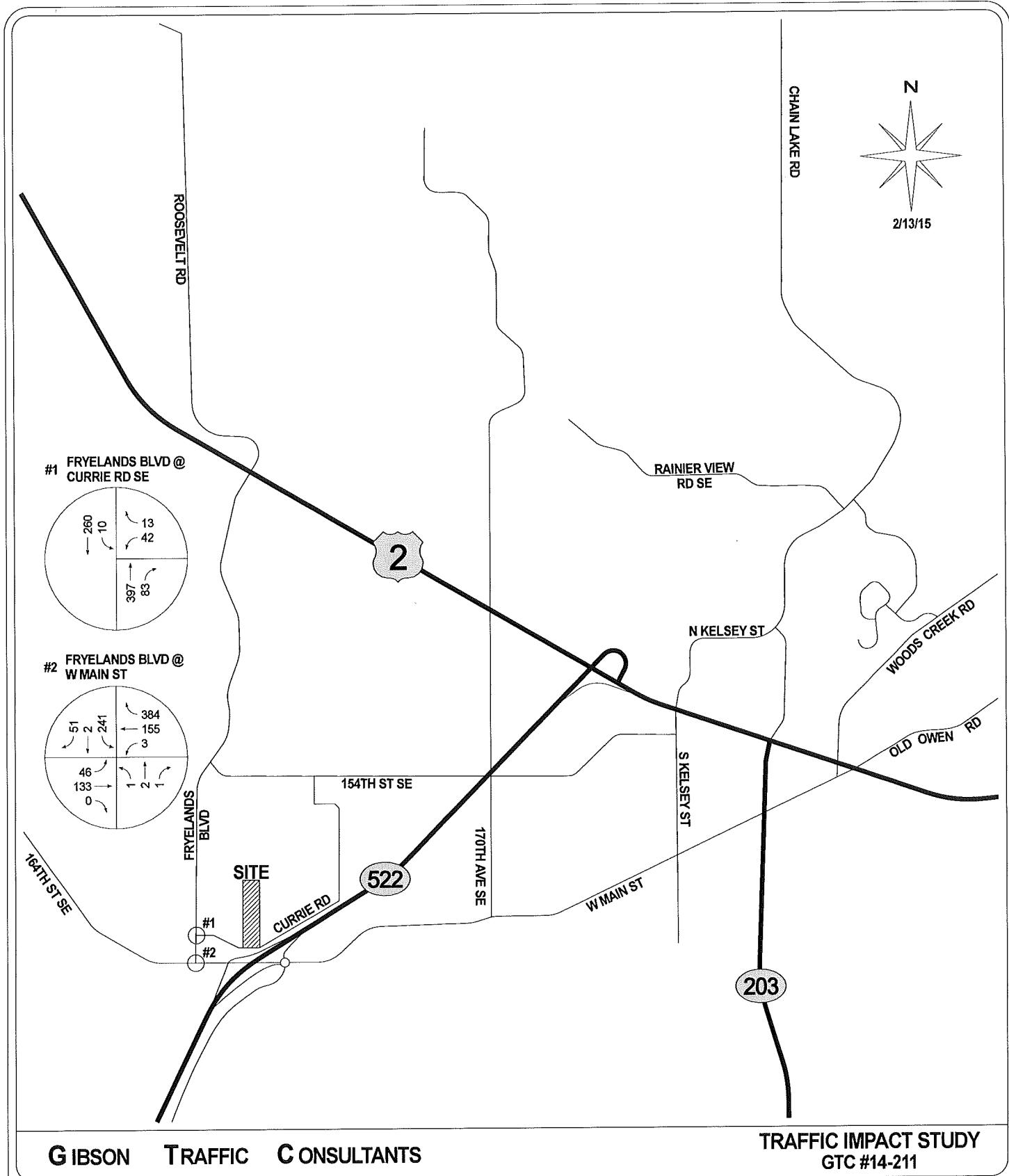
The existing turning movement counts and turning movement calculations are included in the attachments.

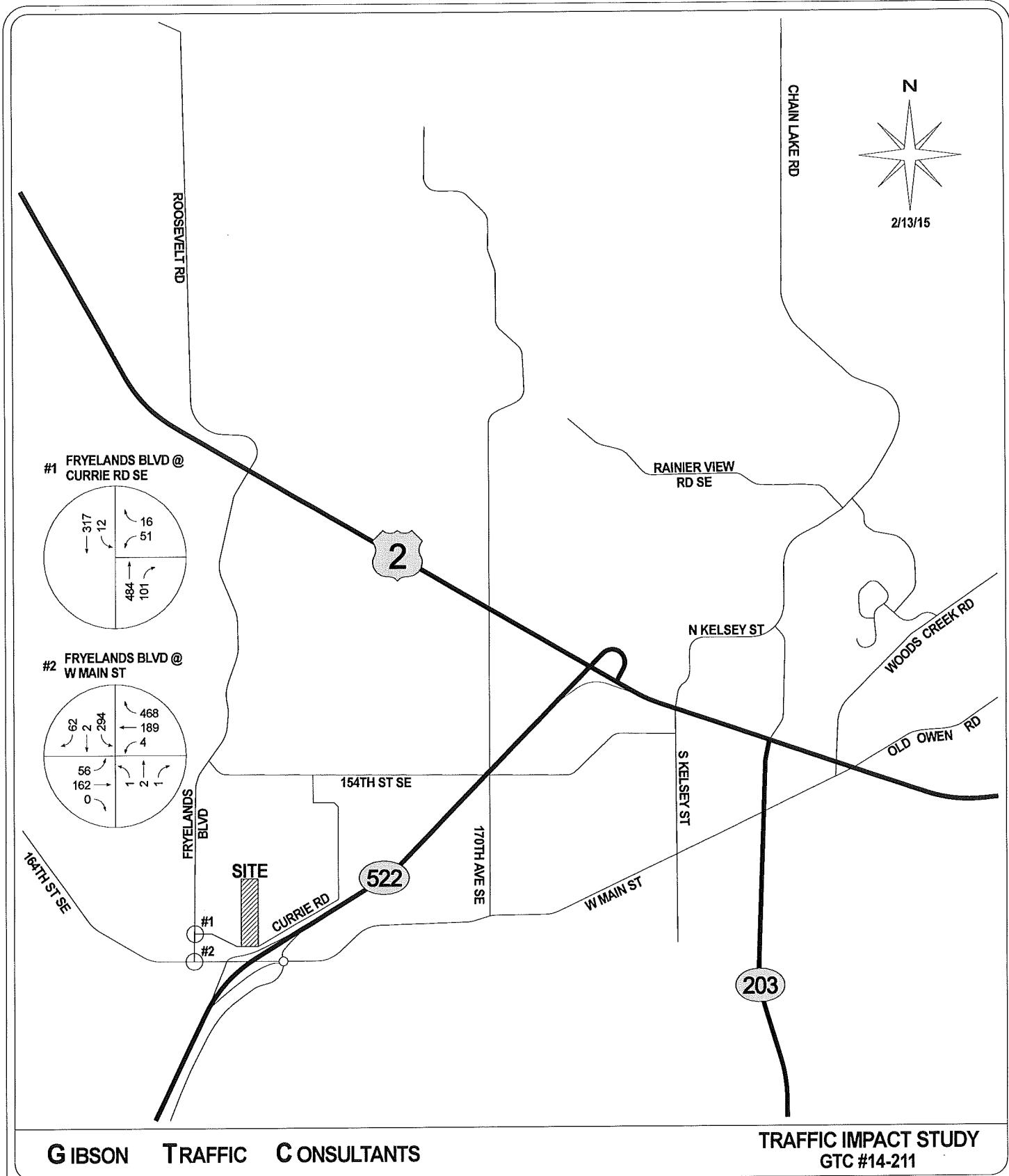
5.2 Intersection Level of Service Results

The level of service analysis has been performed utilizing the existing control, channelization, peak-hour factors and heavy-vehicle factors. Both study intersections are along Fryelands Boulevard which is classified as a minor arterial and therefore have a level of service threshold of LOS D.

The level of service analysis shows that the study intersections operate at LOS C or better under the 2015 existing conditions and the 2025 baseline conditions; and will remain at LOS C or better with the addition of the Hagar Development.

The level of service analysis shows that all of the study intersections are anticipated to operate within acceptable levels. The level of service results for the study intersections are summarized in Table 3.





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33 NEW SINGLE-FAMILY UNITS

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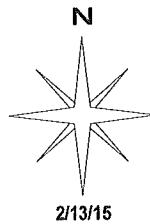
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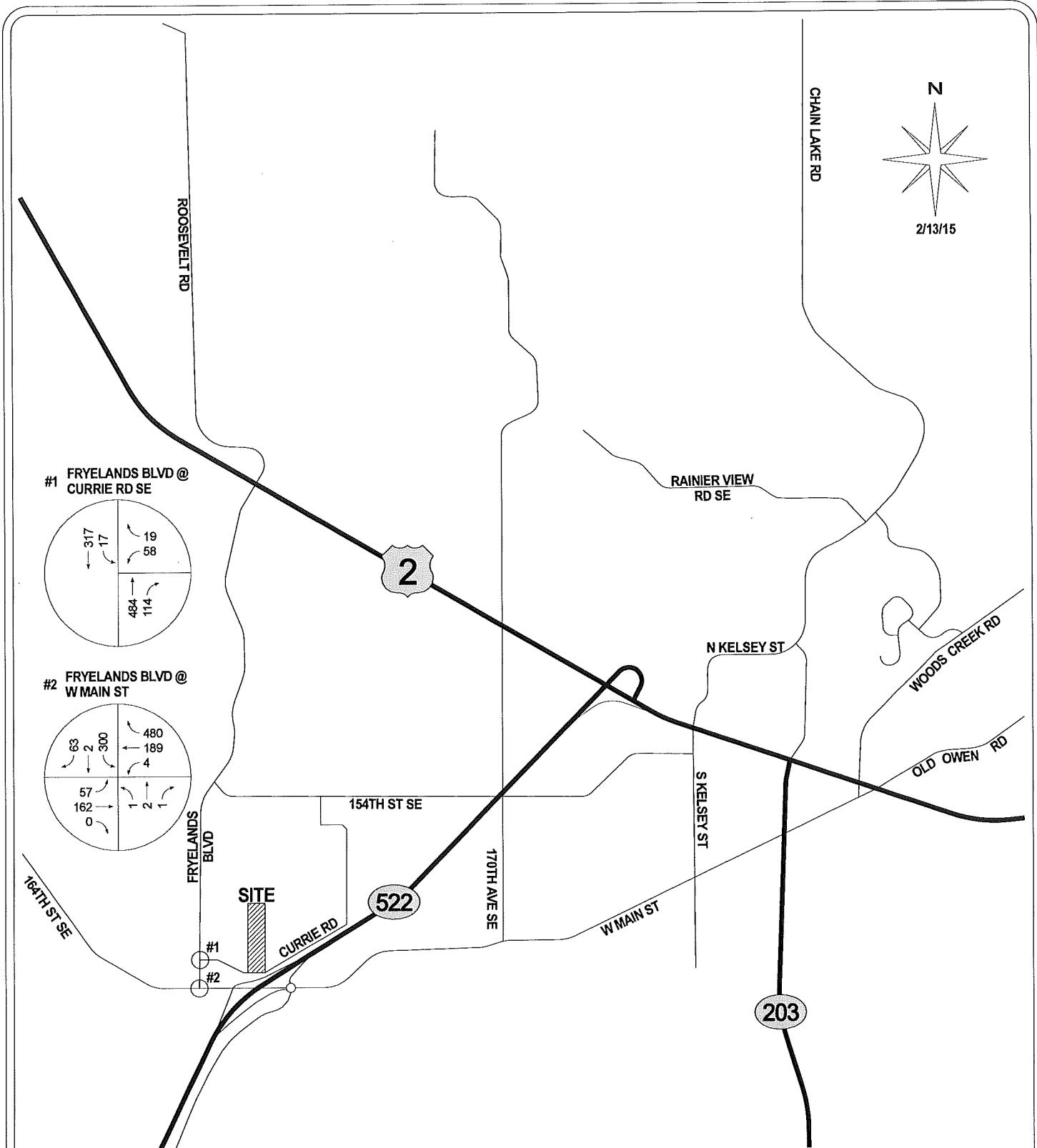
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TURNING MOVEMENT VOLUMES

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FIGURE 5
2025 BASELINE
TURNING MOVEMENTS
PM PEAK-HOUR





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33 NEW SINGLE-FAMILY UNITS

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FIGURE 6
2025 FUTURE
WITH DEVELOPMENT
TURNING MOVEMENTS
PM PEAK-HOUR

Table 3: Intersection Level of Service Summary

Intersection	Approach	2015 Existing Conditions		2025 Baseline Conditions		2025 Future Conditions with Development	
		LOS	Delay	LOS	Delay	LOS	Delay
1. Fryelands Blvd. at Currie Rd.	Westbound	C	15.4 sec	C	19.1 sec	C	20.2 sec
2. Fryelands Blvd. at W. Main St.	Intersection	B	13.4 sec	C	19.1 sec	C	20.1 sec

The level of service calculations are included in the attachments.

6. TRAFFIC MITIGATION FEES

The Washington Growth Management Act and Revised Code of Washington 82.02.050(2) authorize local jurisdictions to establish proportionate share traffic mitigation fees in order to fund capital facilities, such as roads and intersections. The Hagar development is located within the City of Monroe, which has established traffic mitigation fees. The City of Monroe also has interlocal agreements with Snohomish County and WSDOT for traffic mitigation fees.

6.1 City of Monroe

The City of Monroe has established a traffic mitigation fee schedule. The fee for single-family residential units is \$2,815.79 per unit. The 33 new units of the Hagar development will have City of Monroe traffic mitigation fees of \$92,921.07. It should be noted that these fees may not vest and may be higher when the building applications are pulled.

6.2 Snohomish County

The City of Monroe and Snohomish County have an interlocal agreement that provides for the payment of traffic mitigation for impacts to Snohomish County roadways by City of Monroe developments. Traffic mitigation fees are based on predetermined area impacts or impacts to actual improvement projects. The trip distribution shows that the Hagar development will not impact any Snohomish County improvement projects in the Transportation Needs Report with three directional PM peak-hour trips. According to Section 3(a)2 of the *Snohomish County Traffic Worksheet and Traffic Study Requirements for Developments in the City of Monroe*, City of Monroe developments are only required to pay traffic mitigation fees for improvements in the Transportation Needs Report impacted with three directional peak-hour trips. The Hagar development is therefore not required to pay traffic mitigation fees to Snohomish County.

6.3 WSDOT

The City of Monroe and WSDOT have an interlocal agreement that provides for the payment of traffic mitigation fees. The interlocal agreement states that development only has a “significant adverse impact” if the development contributes 25 or more trips to a WSDOT intersection. The Hagar development will not impact any WSDOT intersections with 25 peak-hour trips during the AM or PM peak-hours. The Hagar development is therefore not required to pay traffic mitigation fees to WSDOT.

7. CONCLUSIONS

The Hagar development is proposed to consist of 33 new single-family residential units. The development is anticipated to generate 314 average daily trips with 25 AM peak-hour trips and 33 PM peak-hour trips. The level of service analysis shows that all of the study intersections are anticipated to operate at acceptable levels of service. The Hagar development will have City of Monroe traffic mitigation fees of \$92,921.07. The development will not meet the thresholds for paying traffic mitigation fees to Snohomish County or WSDOT.

Trip Generation Calculations

Trip Generation for: Development Peak Weekday
(a.k.a.): Average Weekday Daily Trips (AWDT)

LAND USES	VARIABLE	NET EXTERNAL TRIPS BY TYPE										DIRECTIONAL ASSIGNMENTS						
		IN BOTH DIRECTIONS						PASS-BY				DIVERTED		LINK		NEW		
		Gross Trips			Internal Crossover			TOTAL		PASS-BY		DIVERTED		LINK		NEW		
ITIE LU code	Trip Rate	% IN	% OUT	In+Out (Total)	% of Gross Trips	In+Out (Total)	% of Ext. Trips	In+Out (Total)	% of Ext. Trips	In+Out (Total)	% of Ext. Trips	In+Out (Total)	% of Ext. Trips	In+Out (Total)	In	Out	In	Out
Single Family Detached	34 Units	2.10	9.52	50%	50%	323.68	0%	0.00	323.68	0%	0.00	0%	0.00	323.68	0.00	0.00	0.00	161.84
Sindle Family Detached	-1 Units	2.10	9.52	50%	50%	-9.52	0%	0.00	-9.52	0%	0.00	0%	0.00	-9.52	0.00	0.00	0.00	-4.76
Total						314.16		0.00	314.16		0.00		0.00	314.16	0.00	0.00	0.00	157.08

**Trip Generation for: Development Peak Weekday, Peak Hour of Adjacent Street Traffic, One Hour between 7 and 9 AM
(a.k.a.): Weekday AM Peak Hour**

LAND USES	VARIABLE	ITE LU code	Trip Rate	% IN	% OUT	% of Gross Trips	Internal Crossover	NET EXTERNAL TRIPS BY TYPE			DIRECTIONAL ASSIGNMENTS		
								IN BOTH DIRECTIONS		% of Ext. Trips	In+Out (Total)	In	Out
								TOTAL	PASS-BY				
Single Family Detached	34 Units	210	0.75	25%	75%	25.50	0%	0.00	25.50	0%	0.00	25.50	0.00
Single Family Detached	-1 Units	210	0.75	25%	75%	-0.75	0%	0.00	-0.75	0%	0.00	-0.75	0.00
Total						24.75	0.00	24.75	0.00	0.00	0.00	24.75	0.00
										0.00	0.00	0.00	0.00

Trip Generation for: Development Peak Weekday, Peak Hour of Adjacent Street Traffic, One Hour between 4 and 6 PM
(a.k.a.): Weekday PM Peak Hour

LAND USES	VARIABLE	ITE LU code	Trip Rate	Gross Trips			Internal Crossover		NET EXTERNAL TRIPS BY TYPE			DIRECTIONAL ASSIGNMENTS				
				% IN	% OUT	% In+Out (Total)	% of Gross Trips	In+Out (Total)	% of Ext. Trips (Total)	In+Out (Total)	% of Ext. Trips (Total)	In	Out	In	Out	
Single Family Detached	34 Units	2:10	1.00	63%	37%	34.00	0%	0.00	34.00	0%	0.00	34.00	0.00	0.00	0.00	21.42
Single Family Detached	-1 Units	2:10	1.00	63%	37%	-1.00	0%	0.00	-1.00	0%	0.00	-1.00	0.00	0.00	0.00	12.58
Total						33.00		0.00	33.00		0.00	33.00	0.00	0.00	0.00	-0.63
																-0.37
																20.79
																12.21

Hagar Development
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AM Peak-Hour

% New ADT	New AM Peak Hour Trips			
	In	Out	Total	
100%	314	6	19	25
1%	3.14	0.06	0.19	0.25
2%	6.28	0.12	0.37	0.50
3%	9.42	0.19	0.56	0.74
4%	12.57	0.25	0.74	0.99
5%	15.71	0.31	0.93	1.24
6%	18.85	0.37	1.11	1.49
7%	21.99	0.43	1.30	1.73
8%	25.13	0.50	1.48	1.98
9%	28.27	0.56	1.67	2.23
10%	31.42	0.62	1.86	2.48
11%	34.56	0.68	2.04	2.72
12%	37.70	0.74	2.23	2.97
13%	40.84	0.80	2.41	3.22
14%	43.98	0.87	2.60	3.47
15%	47.12	0.93	2.78	3.71
16%	50.27	0.99	2.97	3.96
17%	53.41	1.05	3.16	4.21
18%	56.55	1.11	3.34	4.46
19%	59.69	1.18	3.53	4.70
20%	62.83	1.24	3.71	4.95
21%	65.97	1.30	3.90	5.20
22%	69.12	1.36	4.08	5.45
23%	72.26	1.42	4.27	5.69
24%	75.40	1.49	4.45	5.94
25%	78.54	1.55	4.64	6.19
26%	81.68	1.61	4.83	6.44
27%	84.82	1.67	5.01	6.68
28%	87.96	1.73	5.20	6.93
29%	91.11	1.80	5.38	7.18
30%	94.25	1.86	5.57	7.43
31%	97.39	1.92	5.75	7.67
32%	100.53	1.98	5.94	7.92
33%	103.67	2.04	6.12	8.17
34%	106.81	2.10	6.31	8.42
35%	109.96	2.17	6.50	8.66
36%	113.10	2.23	6.68	8.91
37%	116.24	2.29	6.87	9.16
38%	119.38	2.35	7.05	9.41
39%	122.52	2.41	7.24	9.65
40%	125.66	2.48	7.42	9.90
41%	128.81	2.54	7.61	10.15
42%	131.95	2.60	7.80	10.40
43%	135.09	2.66	7.98	10.64
44%	138.23	2.72	8.17	10.89
45%	141.37	2.79	8.35	11.14
46%	144.51	2.85	8.54	11.39
47%	147.66	2.91	8.72	11.63
48%	150.80	2.97	8.91	11.88
49%	153.94	3.03	9.09	12.13
50%	157.08	3.10	9.28	12.38
100%	314.16	6.19	18.56	24.75

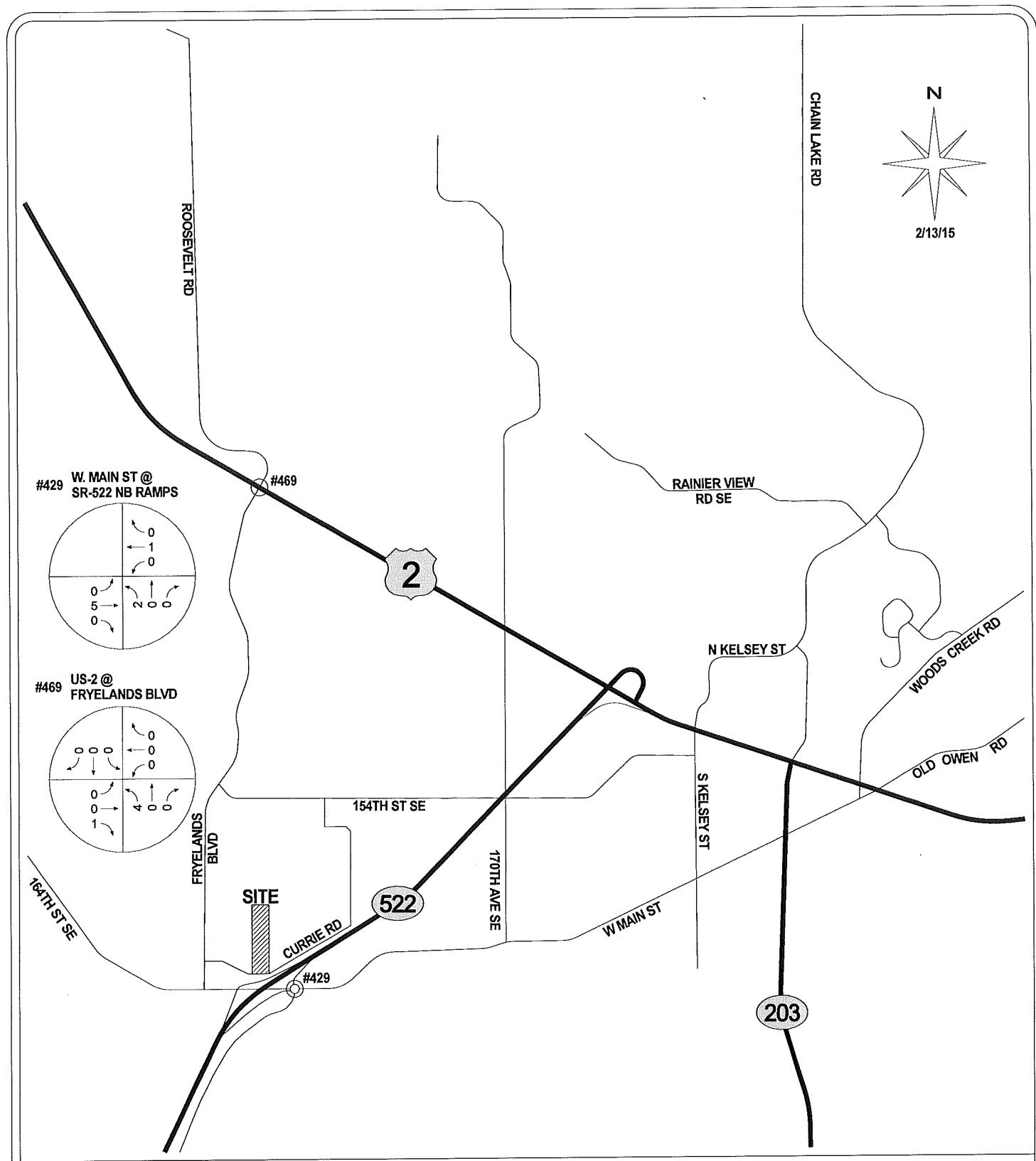
Hagar Development
GTC #14-211

PM Peak-Hour

% 100%	New ADT 314	New PM Peak Hour Trips			
		In	Out	Total	
1%	3.14	0.21	0.12	0.33	
2%	6.28	0.42	0.24	0.66	
3%	9.42	0.62	0.37	0.99	
4%	12.57	0.83	0.49	1.32	
5%	15.71	1.04	0.61	1.65	
6%	18.85	1.25	0.73	1.98	
7%	21.99	1.46	0.85	2.31	
8%	25.13	1.66	0.98	2.64	
9%	28.27	1.87	1.10	2.97	
10%	31.42	2.08	1.22	3.30	
11%	34.56	2.29	1.34	3.63	
12%	37.70	2.49	1.47	3.96	
13%	40.84	2.70	1.59	4.29	
14%	43.98	2.91	1.71	4.62	
15%	47.12	3.12	1.83	4.95	
16%	50.27	3.33	1.95	5.28	
17%	53.41	3.53	2.08	5.61	
18%	56.55	3.74	2.20	5.94	
19%	59.69	3.95	2.32	6.27	
20%	62.83	4.16	2.44	6.60	
21%	65.97	4.37	2.56	6.93	
22%	69.12	4.57	2.69	7.26	
23%	72.26	4.78	2.81	7.59	
24%	75.40	4.99	2.93	7.92	
25%	78.54	5.20	3.05	8.25	
26%	81.68	5.41	3.17	8.58	
27%	84.82	5.61	3.30	8.91	
28%	87.96	5.82	3.42	9.24	
29%	91.11	6.03	3.54	9.57	
30%	94.25	6.24	3.66	9.90	
31%	97.39	6.44	3.79	10.23	
32%	100.53	6.65	3.91	10.56	
33%	103.67	6.86	4.03	10.89	
34%	106.81	7.07	4.15	11.22	
35%	109.96	7.28	4.27	11.55	
36%	113.10	7.48	4.40	11.88	
37%	116.24	7.69	4.52	12.21	
38%	119.38	7.90	4.64	12.54	
39%	122.52	8.11	4.76	12.87	
40%	125.66	8.32	4.88	13.20	
41%	128.81	8.52	5.01	13.53	
42%	131.95	8.73	5.13	13.86	
43%	135.09	8.94	5.25	14.19	
44%	138.23	9.15	5.37	14.52	
45%	141.37	9.36	5.49	14.85	
46%	144.51	9.56	5.62	15.18	
47%	147.66	9.77	5.74	15.51	
48%	150.80	9.98	5.86	15.84	
49%	153.94	10.19	5.98	16.17	
50%	157.08	10.40	6.11	16.50	

% 100%	New ADT 314	New PM Peak Hour Trips			
		In	Out	Total	
51%	160.22	10.60	6.23	16.83	
52%	163.36	10.81	6.35	17.16	
53%	166.50	11.02	6.47	17.49	
54%	169.65	11.23	6.59	17.82	
55%	172.79	11.43	6.72	18.15	
56%	175.93	11.64	6.84	18.48	
57%	179.07	11.85	6.96	18.81	
58%	182.21	12.06	7.08	19.14	
59%	185.35	12.27	7.20	19.47	
60%	188.50	12.47	7.33	19.80	
61%	191.64	12.68	7.45	20.13	
62%	194.78	12.89	7.57	20.46	
63%	197.92	13.10	7.69	20.79	
64%	201.06	13.31	7.81	21.12	
65%	204.20	13.51	7.94	21.45	
66%	207.35	13.72	8.06	21.78	
67%	210.49	13.93	8.18	22.11	
68%	213.63	14.14	8.30	22.44	
69%	216.77	14.35	8.42	22.77	
70%	219.91	14.55	8.55	23.10	
71%	223.05	14.76	8.67	23.43	
72%	226.20	14.97	8.79	23.76	
73%	229.34	15.18	8.91	24.09	
74%	232.48	15.38	9.04	24.42	
75%	235.62	15.59	9.16	24.75	
76%	238.76	15.80	9.28	25.08	
77%	241.90	16.01	9.40	25.41	
78%	245.04	16.22	9.52	25.74	
79%	248.19	16.42	9.65	26.07	
80%	251.33	16.63	9.77	26.40	
81%	254.47	16.84	9.89	26.73	
82%	257.61	17.05	10.01	27.06	
83%	260.75	17.26	10.13	27.39	
84%	263.89	17.46	10.26	27.72	
85%	267.04	17.67	10.38	28.05	
86%	270.18	17.88	10.50	28.38	
87%	273.32	18.09	10.62	28.71	
88%	276.46	18.30	10.74	29.04	
89%	279.60	18.50	10.87	29.37	
90%	282.74	18.71	10.99	29.70	
91%	285.89	18.92	11.11	30.03	
92%	289.03	19.13	11.23	30.36	
93%	292.17	19.33	11.36	30.69	
94%	295.31	19.54	11.48	31.02	
95%	298.45	19.75	11.60	31.35	
96%	301.59	19.96	11.72	31.68	
97%	304.74	20.17	11.84	32.01	
98%	307.88	20.37	11.97	32.34	
99%	311.02	20.58	12.09	32.67	
100%	314.16	20.79	12.21	33.00	

Snohomish County Key Intersection Impacts



GIBSON TRAFFIC CONSULTANTS

**TRAFFIC IMPACT STUDY
GTC #14-211**

**HAGAR DEVELOPMENT
33 NEW SINGLE-FAMILY UNITS**

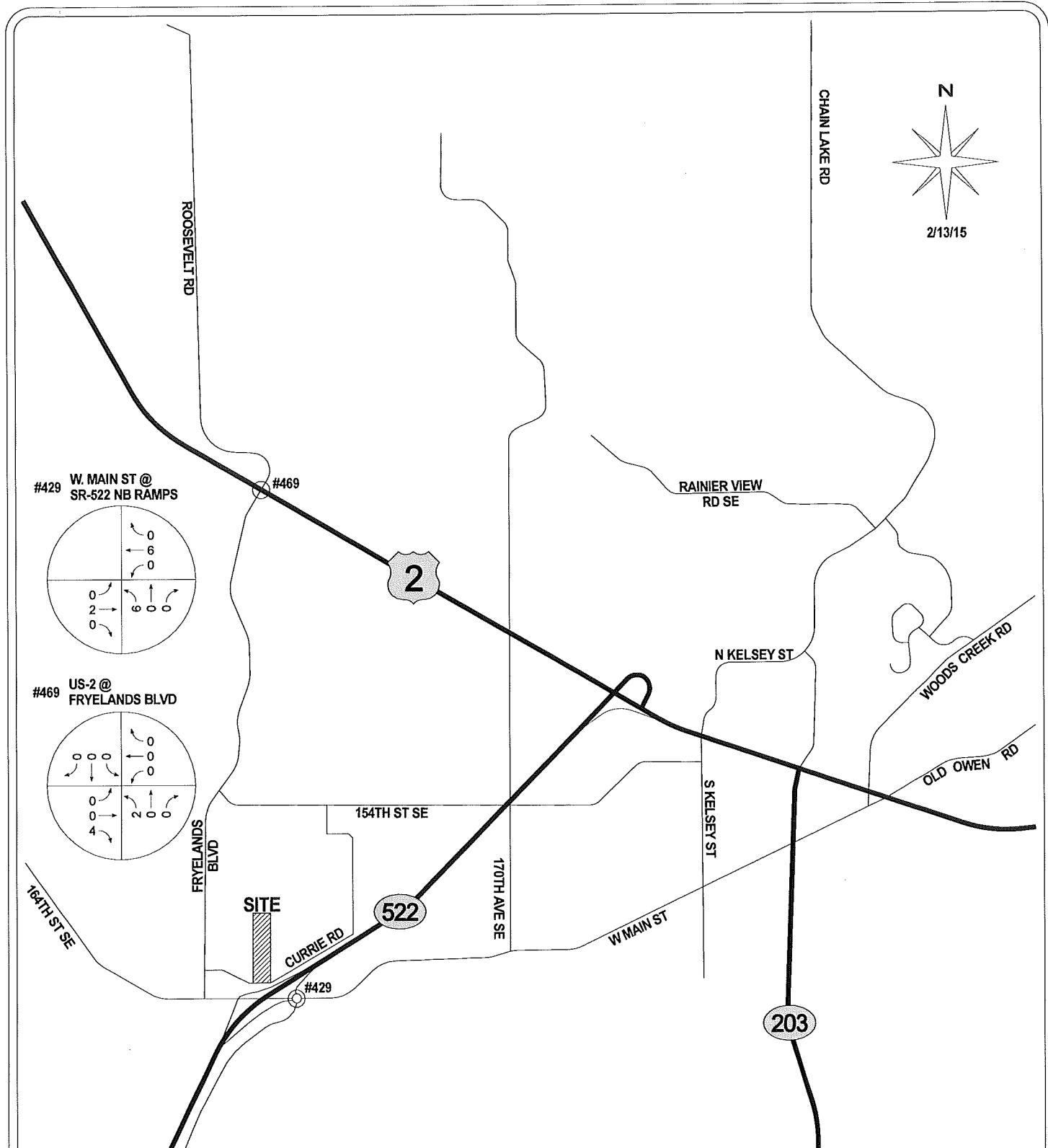
CITY OF MONROE

LEGEND

XXX →

DEVELOPMENT TURNING MOVEMENT VOLUMES

FIGURE A
SNOHOMISH COUNTY
KEY INTERSECTION
AM VOLUMES



GIBSON TRAFFIC CONSULTANTS

HAGAR DEVELOPMENT
33 NEW SINGLE-FAMILY UNITS

CITY OF MONROE

LEGEND

XXX →

DEVELOPMENT TURNING
MOVEMENT VOLUMES

TRAFFIC IMPACT STUDY
GTC #14-211

FIGURE B
SNOHOMISH COUNTY
KEY INTERSECTION
PM VOLUMES
B - 2

AM Peak-Hour Key Intersection Volumes

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
#429: W. Main St @ SR-522 NB Ramps	0	5	0	0	1	0	2	0	0	N/A	N/A	N/A
#469: US-2 @ Fryelands Blvd	0	0	1	0	0	0	4	0	0	0	0	0

PM Peak-Hour Key Intersection Volumes

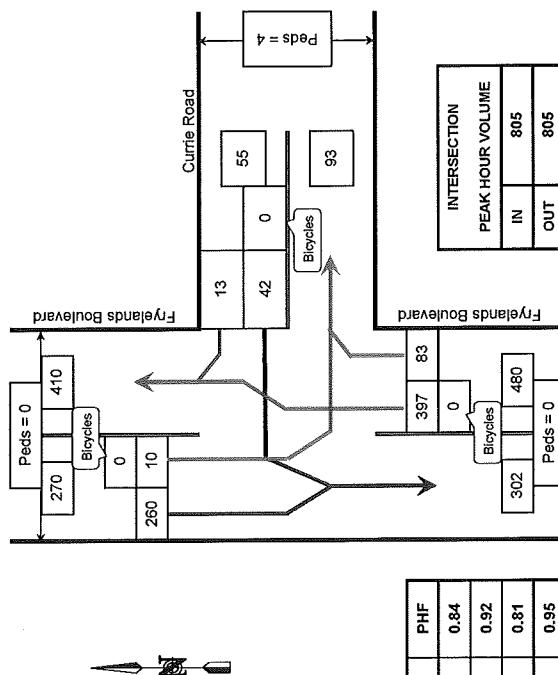
Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
#429: W. Main St @ SR-522 NB Ramps	0	2	0	0	6	0	6	0	0	N/A	N/A	N/A
#469: US-2 @ Fryelands Blvd	0	0	4	0	0	0	2	0	0	0	0	0

Turning Movement Volumes



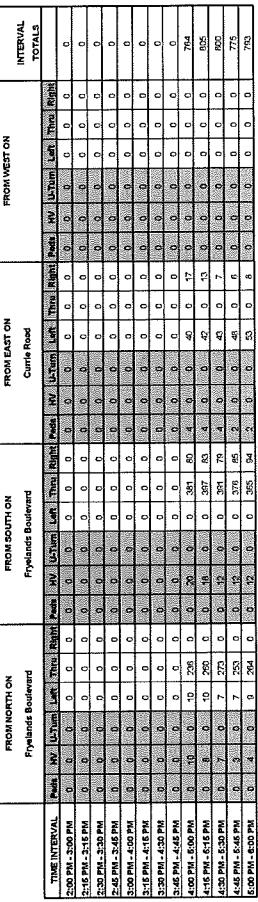
TEACHING MOVEMENTS DIAGRAM

4:00 PM - 6:00 PM PEAK HOUR: 4:15 PM TO 5:15 PM



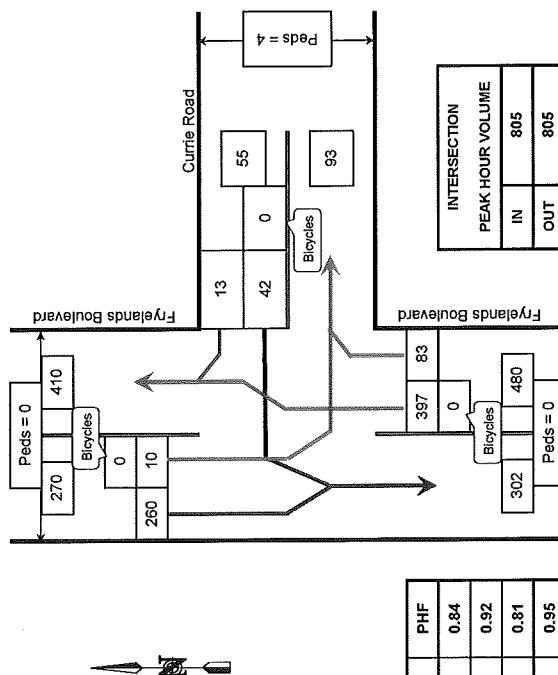
	HV	PHF
SB	3.0%	0.84
NB	3.8%	0.92
WB	0.0%	0.81
INTRS.	3.2%	0.95

HV = Heavy Vehicles
PHF = Peak Hour Factor



INTERSECTION TURNING MOVEMENTS REDUCTION SHEET

1:00 PM - 6:00 PM BREAK HOUR: 1:15 PM TO 5:15 PM



	HV	PHF
SB	3.0%	0.84
NB	3.8%	0.92
WB	0.0%	0.81
INTRS.	3.2%	0.95

Frylands Boulevard @ Currie Road

Monroe, WA

DATE OF COUNT: Tue. 2/10/15

TIME OF COUNT: 4:00 PM - 6:00 PM

WEATHER: Overcast

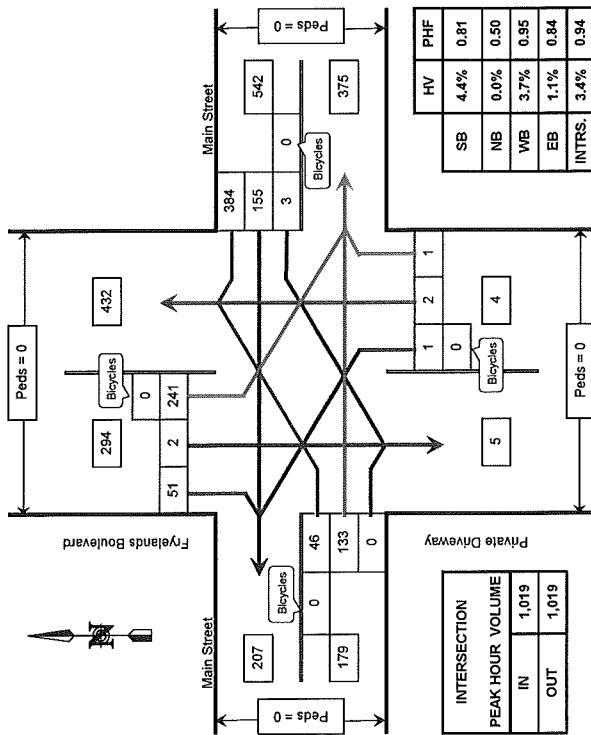
5:00 PM - 8:00 PM

C - 1

DTG TRAFFIC DATA GATHERING

TURNING MOVEMENTS DIAGRAM

4:00 PM - 6:00 PM PEAK HOUR: 4:15 PM TO 5:15 PM



Fryelands Boulevard @ Main Street
Monroe, WA

HV = Heavy Vehicles

DATE OF COUNT: Tue, 2/10/15
TIME OF COUNT: 4:00 PM - 6:00 PM
WEATHER: Overcast

DIG TRAFFIC DATA GATHERING
INTERSECTION TURNING MOVEMENTS REDUCTION SHEET

INTERSECTION TURNING MOVEMENTS REDUCTION SHEET

LOCATION:	Edwards Boulevard & Main Street		DATE OF COUNT:		TIME OF COUNT:		COUNTER BY:		WEATHER:		CEN	
	Monte, WA	Private Driveway	106,2916	106,2916	4:00 PM - 5:00 PM						Count	Percent
TIME INTERVAL ENDING AT	FROM NORTH ON Edwards Boulevard		FROM SOUTH ON Private Driveway		FROM EAST ON Main Street		FROM WEST ON Main Street		INTERVAL TOTALS			
	Per Sec	KV Uctm	Lft	Rght	Per Sec	KV Uctm	Lft	Rght	Per Sec	KV Uctm	Left	Right
02:16 PM	0	0	0	0	0	0	0	0	0	0	0	0
02:20 PM	1	0	0	0	0	0	0	0	0	0	0	0
02:24 PM	0	0	0	0	0	0	0	0	0	0	0	0
02:28 PM	0	0	0	0	0	0	0	0	0	0	0	0
02:32 PM	0	0	0	0	0	0	0	0	0	0	0	0
02:36 PM	0	0	0	0	0	0	0	0	0	0	0	0
02:40 PM	0	0	0	0	0	0	0	0	0	0	0	0
02:44 PM	0	0	0	0	0	0	0	0	0	0	0	0
02:48 PM	0	0	0	0	0	0	0	0	0	0	0	0
02:52 PM	0	0	0	0	0	0	0	0	0	0	0	0
02:56 PM	0	0	0	0	0	0	0	0	0	0	0	0
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
03:04 PM	0	0	0	0	0	0	0	0	0	0	0	0
03:08 PM	0	0	0	0	0	0	0	0	0	0	0	0
03:12 PM	0	0	0	0	0	0	0	0	0	0	0	0
03:16 PM	0	0	0	0	0	0	0	0	0	0	0	0
03:20 PM	0	0	0	0	0	0	0	0	0	0	0	0
03:24 PM	0	0	0	0	0	0	0	0	0	0	0	0
03:28 PM	0	0	0	0	0	0	0	0	0	0	0	0
03:32 PM	0	0	0	0	0	0	0	0	0	0	0	0
03:36 PM	0	0	0	0	0	0	0	0	0	0	0	0
03:40 PM	0	0	0	0	0	0	0	0	0	0	0	0
03:44 PM	0	0	0	0	0	0	0	0	0	0	0	0
03:48 PM	0	0	0	0	0	0	0	0	0	0	0	0
03:52 PM	0	0	0	0	0	0	0	0	0	0	0	0
03:56 PM	0	0	0	0	0	0	0	0	0	0	0	0
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HOUR TOTALS	0	19	0	241	2	61	0	9	1	2	1	0
ALL MOVEMENTS	284								4		62	1019
PEAK HOUR FACTOR	0.81								0.0%		3.7%	3.4%

DATE OF REDUCTION: 2/10/2015
PFH = Peak Hour Factor
PFH = 1.000000
4:00 PM - 6:00 PM PEAK HOUR: 4:15 PM TO 6:15 PM

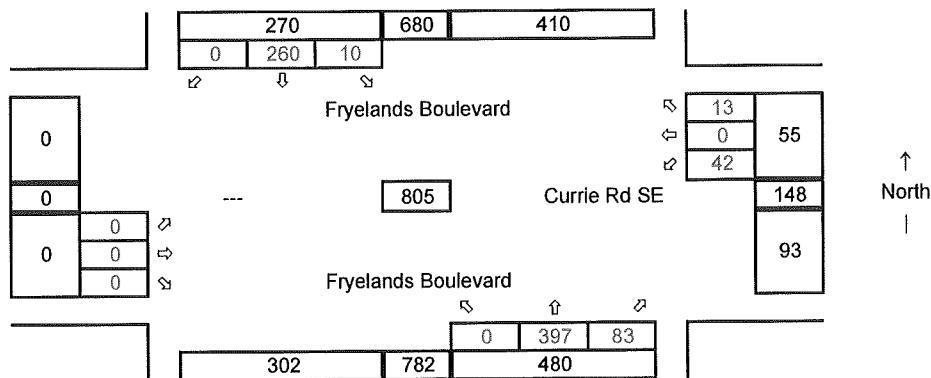
#1 Fryelands Blvd @ Currie Rd

Synchro ID: 1

Existing
Average Weekday
PM Peak Hour

Date 2/10/2015

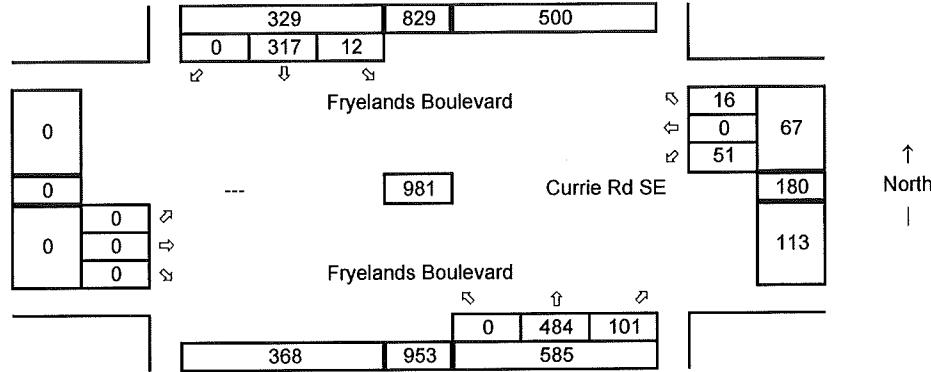
Data Source: TDG



Future w/o Development

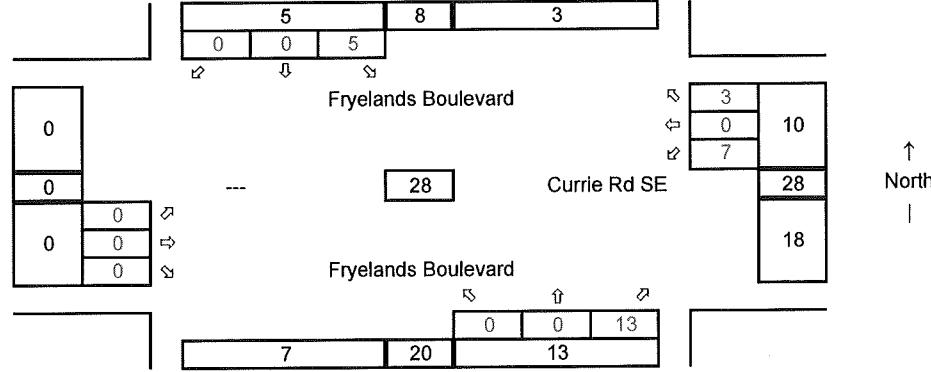
Average Weekday
PM Peak Hour

Year: 2025
Growth Rate = 2.0%
Years of Growth = 10
Total Growth = 1.2190



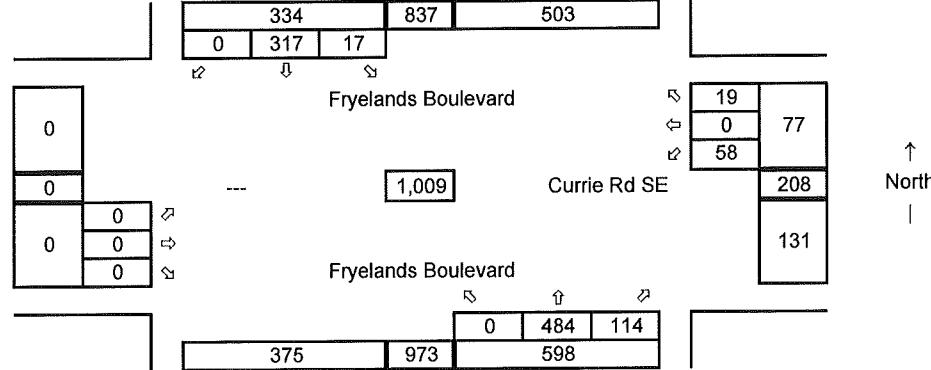
Total Development Trips

Average Weekday
PM Peak Hour



Future with Project

Average Weekday
PM Peak Hour



#2 Fryelands Blvd @ W. Main St.

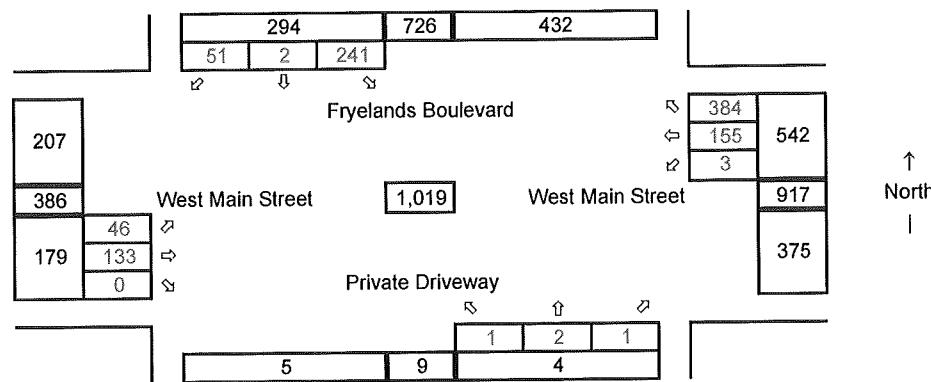
Synchro ID: 2

Existing

Average Weekday
PM Peak Hour

Date 2/10/2015

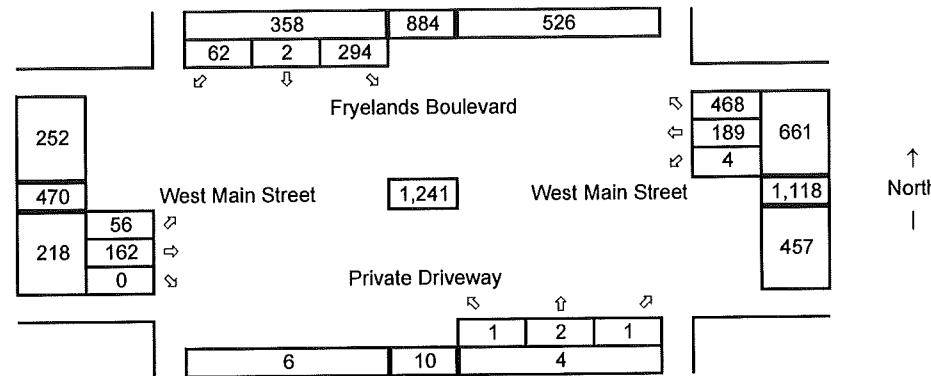
Data Source: TDG



Future w/o Development

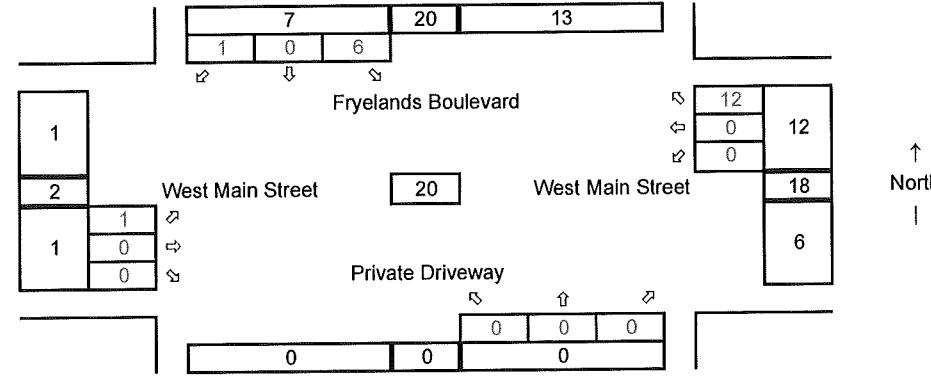
Average Weekday
PM Peak Hour

Year: 2025
Growth Rate = 2.0%
Years of Growth = 10
Total Growth = 1.2190



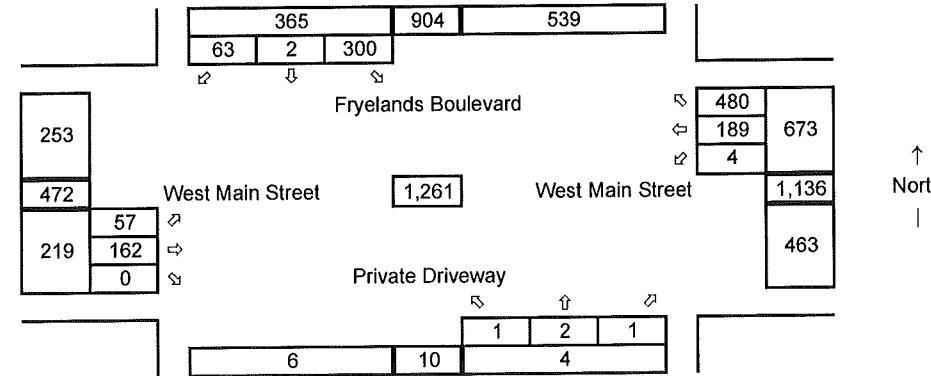
Total Development Trips

Average Weekday
PM Peak Hour



Future with Project

Average Weekday
PM Peak Hour



Level of Service Calculations

Intersection

Int Delay, s/veh 1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	42	13	397	83	10	260
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	44	14	418	87	11	274

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	757	253	505
Stage 1	462	-	-
Stage 2	295	-	-
Critical Hdwy	6.645	6.945	4.16
Critical Hdwy Stg 1	5.845	-	-
Critical Hdwy Stg 2	5.445	-	-
Follow-up Hdwy	3.5285	3.3285	2.23
Pot Cap-1 Maneuver	357	745	1049
Stage 1	599	-	-
Stage 2	752	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	353	745	1049
Mov Cap-2 Maneuver	353	-	-
Stage 1	599	-	-
Stage 2	744	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.4	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	403	1049	-
HCM Lane V/C Ratio	-	-	0.144	0.01	-
HCM Control Delay (s)	-	-	15.4	8.5	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	0.5	0	-

Intersection

Intersection Delay, s/veh	13.4											
Intersection LOS	B											
Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	46	133	0	0	3	155	384	0	1	2	1
Peak Hour Factor	0.92	0.94	0.94	0.94	0.92	0.94	0.94	0.94	0.92	0.94	0.94	0.94
Heavy Vehicles, %	2	3	3	3	2	3	3	3	2	3	3	3
Mvmt Flow	0	49	141	0	0	3	165	409	0	1	2	1
Number of Lanes	0	0	1	0	0	0	1	1	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	2	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	2
HCM Control Delay	11.4	13.5	9.4
HCM LOS	B	B	A

Lane	NBLn1	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	25%	26%	2%	0%	82%
Vol Thru, %	50%	74%	98%	0%	1%
Vol Right, %	25%	0%	0%	100%	17%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	4	179	158	384	294
LT Vol	1	46	3	0	241
Through Vol	2	133	155	0	2
RT Vol	1	0	0	384	51
Lane Flow Rate	4	190	168	409	313
Geometry Grp	2	5	7	7	2
Degree of Util (X)	0.007	0.307	0.271	0.578	0.503
Departure Headway (Hd)	6.337	5.8	5.811	5.093	5.788
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	563	619	619	707	622
Service Time	4.396	3.839	3.545	2.826	3.82
HCM Lane V/C Ratio	0.007	0.307	0.271	0.579	0.503
HCM Control Delay	9.4	11.4	10.7	14.6	14.6
HCM Lane LOS	A	B	B	B	B
HCM 95th-tile Q	0	1.3	1.1	3.7	2.8

Intersection

Intersection Delay, s/veh

Intersection LOS

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	241	2	51
Peak Hour Factor	0.92	0.94	0.94	0.94
Heavy Vehicles, %	2	3	3	3
Mvmt Flow	0	256	2	54
Number of Lanes	0	0	1	0

Approach SB

Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	2
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	14.6
HCM LOS	B

Lane

HCM 2010 TWSC
1: Fryelands Boulevard & Currie Rd SE

Hagar Development

Intersection

Int Delay, s/veh 1.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	51	16	484	101	12	317
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	54	17	509	106	13	334

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	922	308	0 0 616 0
Stage 1	563	-	-
Stage 2	359	-	-
Critical Hdwy	6.645	6.945	- 4.16 -
Critical Hdwy Stg 1	5.845	-	-
Critical Hdwy Stg 2	5.445	-	-
Follow-up Hdwy	3.5285	3.3285	- 2.23 -
Pot Cap-1 Maneuver	283	686	- 953 -
Stage 1	532	-	-
Stage 2	703	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	279	686	- 953 -
Mov Cap-2 Maneuver	279	-	-
Stage 1	532	-	-
Stage 2	693	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.1	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBL	Ln1	SBL	SBT
Capacity (veh/h)	-	-	325	953	-	
HCM Lane V/C Ratio	-	-	0.217	0.013	-	
HCM Control Delay (s)	-	-	19.1	8.8	-	
HCM Lane LOS	-	-	C	A	-	
HCM 95th %tile Q(veh)	-	-	0.8	0	-	

Intersection

Intersection Delay, s/veh	19.1											
Intersection LOS	C											
Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	56	162	0	0	4	189	468	0	1	2	1
Peak Hour Factor	0.92	0.94	0.94	0.94	0.92	0.94	0.94	0.94	0.92	0.94	0.94	0.94
Heavy Vehicles, %	2	3	3	3	2	3	3	3	2	3	3	3
Mvmt Flow	0	60	172	0	0	4	201	498	0	1	2	1
Number of Lanes	0	0	1	0	0	0	1	1	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	2	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	2
HCM Control Delay	13.6	20.4	10.2
HCM LOS	B	C	B

Lane	NBLn1	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	25%	26%	2%	0%	82%
Vol Thru, %	50%	74%	98%	0%	1%
Vol Right, %	25%	0%	0%	100%	17%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	4	218	193	468	358
LT Vol	1	56	4	0	294
Through Vol	2	162	189	0	2
RT Vol	1	0	0	468	62
Lane Flow Rate	4	232	205	498	381
Geometry Grp	2	5	7	7	2
Degree of Util (X)	0.008	0.405	0.355	0.76	0.653
Departure Headway (Hd)	7.174	6.288	6.218	5.496	6.173
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	502	571	577	657	583
Service Time	5.174	4.358	3.977	3.255	4.226
HCM Lane V/C Ratio	0.008	0.406	0.355	0.758	0.654
HCM Control Delay	10.2	13.6	12.4	23.7	20.2
HCM Lane LOS	B	B	B	C	C
HCM 95th-tile Q	0	2	1.6	7	4.7

Intersection

Intersection Delay, s/veh

Intersection LOS

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	294	2	62
Peak Hour Factor	0.92	0.94	0.94	0.94
Heavy Vehicles, %	2	3	3	3
Mvmt Flow	0	313	2	66
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	2
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	20.2
HCM LOS	C

Lane

Intersection

Int Delay, s/veh 1.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	58	19	484	114	17	317
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	3	3	3	3	3	3
Mvmt Flow	61	20	509	120	18	334

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	938	315	0 0 629 0
Stage 1	569	-	- - - -
Stage 2	369	-	- - - -
Critical Hdwy	6.645	6.945	- - 4.16 -
Critical Hdwy Stg 1	5.845	-	- - - -
Critical Hdwy Stg 2	5.445	-	- - - -
Follow-up Hdwy	3.5285	3.3285	- - 2.23 -
Pot Cap-1 Maneuver	276	679	- - 942 -
Stage 1	528	-	- - - -
Stage 2	696	-	- - - -
Platoon blocked, %		- -	- - - -
Mov Cap-1 Maneuver	271	679	- - 942 -
Mov Cap-2 Maneuver	271	-	- - - -
Stage 1	528	-	- - - -
Stage 2	683	-	- - - -

Approach	WB	NB	SB
HCM Control Delay, s	20.2	0	0.5
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	318	942	-
HCM Lane V/C Ratio	-	-	0.255	0.019	-
HCM Control Delay (s)	-	-	20.2	8.9	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	1	0.1	-

Intersection

Intersection Delay, s/veh	20.1											
Intersection LOS	C											
Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	57	162	0	0	4	189	480	0	1	2	1
Peak Hour Factor	0.92	0.94	0.94	0.94	0.92	0.94	0.94	0.94	0.92	0.94	0.94	0.94
Heavy Vehicles, %	2	3	3	3	2	3	3	3	2	3	3	3
Mvmt Flow	0	61	172	0	0	4	201	511	0	1	2	1
Number of Lanes	0	0	1	0	0	0	1	1	0	0	1	0

Approach

	EB		WB		NB
Opposing Approach	WB		EB		SB
Opposing Lanes	2		1		1
Conflicting Approach Left	SB		NB		EB
Conflicting Lanes Left	1		1		1
Conflicting Approach Right	NB		SB		WB
Conflicting Lanes Right	1		1		2
HCM Control Delay	13.8		21.8		10.3
HCM LOS	B		C		B

Lane	NBLn1	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	25%	26%	2%	0%	82%
Vol Thru, %	50%	74%	98%	0%	1%
Vol Right, %	25%	0%	0%	100%	17%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	4	219	193	480	365
LT Vol	1	57	4	0	300
Through Vol	2	162	189	0	2
RT Vol	1	0	0	480	63
Lane Flow Rate	4	233	205	511	388
Geometry Grp	2	5	7	7	2
Degree of Util (X)	0.009	0.41	0.357	0.785	0.669
Departure Headway (Hd)	7.25	6.342	6.256	5.534	6.206
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	497	564	573	649	582
Service Time	5.25	4.417	4.021	3.298	4.263
HCM Lane V/C Ratio	0.008	0.413	0.358	0.787	0.667
HCM Control Delay	10.3	13.8	12.5	25.6	21
HCM Lane LOS	B	B	B	D	C
HCM 95th-tile Q	0	2	1.6	7.6	5

Intersection

Intersection Delay, s/veh

Intersection LOS

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	300	2	63
Peak Hour Factor	0.92	0.94	0.94	0.94
Heavy Vehicles, %	2	3	3	3
Mvmt Flow	0	319	2	67
Number of Lanes	0	0	1	0

Approach SB

Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	2
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	21
HCM LOS	C

Lane

Site Plan

